

CLAIMS

1. A lithographic projection apparatus comprising:
  - 5 a radiation system to provide a projection beam of radiation;
  - a support structure to support beam patterning structure which can be used to pattern the projection beam according to a desired pattern;
  - 10 a substrate table to hold a substrate;
  - a projection system to image the patterned beam onto a target portion on a first side of the substrate;
  - 15 an alignment system to align a pattern of the patterning structure with an alignment mark provided on the substrate, using alignment radiation; and
  - an optical system to transmit an image of the alignment mark from a side of the substrate opposite the target portion for use by the alignment system.
- 15 2. An apparatus according to claim 1, wherein said optical system is arranged to transmit an image of said alignment mark at a plane of the first side of the substrate.
3. An apparatus according to claim 1 wherein said optical system is constructed and arranged to transmit a plurality of images, each image corresponding to a respective one 20 of a plurality of alignment marks.
4. An apparatus according to claim 1 wherein said optical system comprises at least two mirrors and two lenses.
- 25 5. An apparatus according to claim 1, wherein said optical system comprises at least one optical fiber.
6. An apparatus according to claim 1 wherein the optical system is arranged to provide the image at a location displaced laterally from the corresponding alignment mark 30 and beyond the periphery of the area to be occupied by the substrate.
7. An apparatus according to claim 1 wherein said alignment mark is on the side of the substrate opposite the target portion.

8. An apparatus according to claim 7, wherein said alignment system is adapted to perform alignment using a reference mark provided on the first side of the substrate in addition to using said alignment mark image provided by said optical system.

5 9. An apparatus according to claim 1, wherein said alignment mark is on the first side of the substrate, said alignment radiation is substantially transmissible through the substrate, said alignment radiation is transmitted through the substrate during alignment of the patterning structure with the alignment mark.

10 10. An apparatus according to claim 9, wherein the alignment radiation comprises infra-red radiation.

11. An apparatus according to claim 1, wherein the alignment radiation and the projection beam have substantially the same wavelength.

15 12. A device manufacturing method comprising:

projecting a patterned beam of radiation onto a target area of a layer of radiation-sensitive material on a first side of a substrate;

aligning a pattern of a patterning structure with an alignment mark provided on the substrate,

transmitting an image of said alignment mark from a side of the substrate opposite the target portion for use in the aligning; and

aligning said image of said alignment mark with the pattern of the patterning structure used in the projecting the patterned beam of radiation.

25

13. A method according to claim 12, further comprising:

turning over the substrate so that said first side and said second side are swapped; and repeating the aligning.

30 14. A device manufactured according to the method of claim 12.

15. A substrate to be imaged by a lithographic projection apparatus, comprising:  
a first side including a target portion at least partially covered with a photosensitive material;

a second side opposite to the side including the target portion, the second side having an alignment mark for use with an alignment system of the lithographic projection apparatus.

5 16. A substrate as in claim 15, wherein the first side further includes an alignment mark for use with the alignment system of the lithographic projection system.

4014647 20140702 P001